

JBM Requirements for MScs (‘Technical’ & ‘Non-technical’)

Valid from 2016 to 2022 in line with Engineering Council’s AHEP3 Learning Outcomes¹

Introduction

1. The terms ‘Technical’ and ‘Non-technical’ are used to distinguish between MScs that are assessed to have a strong technical content from others with a less strong overall technical content. The distinction is made as some graduates require a ‘Technical’ MSc to complete their educational requirements for registration as CEng, whereas other graduates may select either type of MSc.
2. This document provides guidance on the graduates in each situation, and on the Learning Outcome (LO) requirements of ‘Technical’ and ‘Non-technical’ MScs.

Technical MSc

3. A ‘Technical’ MSc programme is one in which at least 50% of the taught modules AND the dissertation are of a technical nature. The academic credits usually provide the basis for assessing the percentage. To be of a technical nature it is likely that the topics covered will be from the JBM List A subjects (i.e. structures, materials, geotechnics) and/or fluid mechanics and water engineering, surveying, infrastructure and transportation engineering, public health and environmental engineering. Such modules should additionally focus on the science and mathematics, engineering analysis, design, and engineering practice learning outcomes that distinguish a BEng (Hons) accredited at CEng with further learning graduate from an IEng graduate (see JBMFL09b Guidelines for MScs and Programmes of CEng FL).
4. A ‘Technical’ dissertation should also be in one of the above technical subjects, should demonstrate a sound understanding of engineering principles and an ability to apply them to analyse key engineering problems. It should involve the use of analytical methods or modelling techniques, and to have required the definition and investigation of a problem including consideration of aspects of the wider engineering context such as environmental and sustainability implications; ethical, health, safety, security and risk issues; intellectual property; and legal, contractual, quality and cost issues. The assessment of the dissertation should have required the individual to demonstrate an ability to plan, manage and evaluate the outcomes of their work and an ability to communicate it to both technical and non-technical audiences.

‘Technical’ or ‘Non-Technical’ required?

5. Graduates with a BEng(Hons) that is accredited by their Institution as partially meeting the educational requirements for CEng may select either type of MSc to complete their educational requirements for CEng. Graduates with other bachelor level qualifications that are accepted by their Institution as partially meeting the educational requirements for CEng, on an individual case basis, may also do so.
6. Graduates with other bachelor level qualifications or equivalent that are acceptable to their Institution for IEng registration require a ‘Technical’ MSc.

¹ THE ACCREDITATION OF HIGHER EDUCATION PROGRAMMES, UK Standard for Professional Engineering Competence, Third edition.

Content of 'Technical' and 'Non-technical' MScs and FL Programmes

7. The requirements of Technical and 'Non-technical' MScs in relation to the coverage of Engineering Council learning output standards are given in Table 1.
 - a. Teaching/learning on all accredited MScs must deliver LOs 1- 22 in Table 1
 - b. Technical MScs must also deliver LOs 23 and 24. The two additional LOs lend themselves to JBM's requirement for a technical project but course providers are free to determine how they are best achieved.
8. Evidence must be available that all LOs included in an MSc programme have been assessed and achieved.

Table 1: Learning Outcomes for MScs and FL Programmes, with JBM Categories of LO for ‘Technical’ and ‘Non-technical’

The table in below lists the Learning Outcomes (LOs) required of:

- **‘Technical’ MScs** used as Further Learning for registration as a Chartered Engineer (CEng) when in combination with a course that is accredited as fully meeting the academic requirement for registration as an Incorporated Engineer (IEng) but no more.
- **‘Non-technical’ MScs** used as Further Learning for registration as a Chartered Engineer (CEng) when in combination with a course that is accredited as fully meeting the academic requirement for registration as an Incorporated Engineer (IEng) and partially meeting the academic requirement for registration as a Chartered Engineer (CEng).

The two additional LOs for ‘Technical’ MScs lend themselves to JBM’s requirement for a technical project but course providers are free to determine how they are best achieved.

No.	Learning Outcome	Required by
-	Science and mathematics	
1	A comprehensive understanding of the relevant scientific principles of the specialisation;	All JBM accredited MSc courses
2	A critical awareness of current problems and/or new insights much of which is at, or informed by, the forefront of the specialisation;	All JBM accredited MSc courses
3	Understanding of concepts relevant to the discipline, some from outside engineering, and the ability to evaluate them critically and to apply them effectively, including in engineering projects.	All JBM accredited MSc courses
-	Engineering Analysis	
4	Ability both to apply appropriate engineering analysis methods for solving complex problems in engineering and to assess their limitations	All JBM accredited MSc courses
5	The ability to use fundamental knowledge to investigate new and emerging technologies;	All JBM accredited MSc courses
6	The ability to collect and analyse research data and use appropriate engineering tools to tackle unfamiliar problems, such as those with uncertain or incomplete data or specifications, by the appropriate innovation, use or adaptation of engineering analytical methods.	All JBM accredited MSc courses
-	Design	



7	Knowledge, understanding and skills to work with information that may be incomplete or uncertain, quantify the effect of this on the design and, where appropriate, use theory or experimental research to mitigate deficiencies	All JBM accredited MSc courses
8	Knowledge and comprehensive understanding of design processes and methodologies and the ability to apply and adapt them in unfamiliar situations	All JBM accredited MSc courses
9	Ability to generate an innovative design for products, systems, components or processes to fulfil new needs.	All JBM accredited MSc courses
-	Economic, legal, social, ethical and environmental context	
10	Awareness of the need for a high level of professional and ethical conduct in engineering	All JBM accredited MSc courses
11	Awareness that engineers need to take account of the commercial and social contexts in which they operate	All JBM accredited MSc courses
12	Knowledge and understanding of management and business practices, and their limitations, and how these may be applied in the context of the particular specialisation;	All JBM accredited MSc courses
13	Awareness that engineering activities should promote sustainable development and ability to apply quantitative techniques where appropriate	All JBM accredited MSc courses
14	Awareness of relevant regulatory requirements governing engineering activities in the context of the particular specialisation	All JBM accredited MSc courses
15	Awareness of and ability to make general evaluations of risk issues in the context of the particular specialisation, including health & safety, environmental and commercial risk.	All JBM accredited MSc courses
-	Engineering practice	
16	Advanced level knowledge and understanding of a wide range of engineering materials and components;	All JBM accredited MSc courses
17	A thorough understanding of current practice and its limitations, and some appreciation of likely new developments;	All JBM accredited MSc courses



18	The ability to apply engineering techniques taking account of a range of commercial and industrial constraints.	All JBM accredited MSc courses
19	Understanding of different roles within an engineering team and the ability to exercise initiative and personal responsibility, which may be as a team member or leader;	All JBM accredited MSc courses
-	Additional general skills	
20	Apply their skills in problem solving, communication, information retrieval, working with others, and the effective use of general IT facilities	All JBM accredited MSc courses
21	Plan self-learning and improve performance, as the foundation for lifelong learning/CPD	All JBM accredited MSc courses
22	Monitor and adjust a personal programme of work on an on-going basis	All JBM accredited MSc courses
-	"Exercise initiative and personal responsibility, which may be as a team member or leader" is covered by 19 above.	-
-	Technical <i>i.e. the additional LOs that are required for those with a bachelor's degree accredited as meeting the academic requirement for registration as an Incorporated Engineer (IEng) but no more</i>	
23	A comprehensive knowledge and understanding of mathematical, statistical and computational models and methods relevant to their engineering specialism, with an ability to apply them to engineering problems and appreciate their limitations (under Science & Mathematics)	'Technical' JBM accredited MSc courses only
24	An understanding of the key drivers for business success, including innovation, calculated commercial risks, customer satisfaction with an awareness that these may vary in different international markets (under Economic, legal, social, ethical and environmental context)	'Technical' JBM accredited MSc courses only

